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IS 11708 (1986): Hand, Mechanical [MHD 10: Medical Laboratory Instruments]

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IS : 11708 - 1986

(Reaffirmed 2002)

Indian Standard

SPECIFICATION FOR HAND, MECHANICAL

1. Scope — Specifies the requirements of mechanically operated voluntary opening type of functional hands covering following types.

1.1 Functional hand with movable three fingers chuck grip (thumb, index and middle fingers).

1.2 Functional hand with movable all fingers clasp grip (thumb and all fingers).

1.3 Functional hand with movable thumb — (a) Pinch type, and (b) Grasp type.

2. Dimensions

2.1 The hand shall generally be made in three different sizes, namely, small, medium and large. The dimensions of these sizes shall be as indicated in Table 1.

TABLE 1 DIMENSIONS OF MECHANICAL HAND

Size	Length		Width	
	l_1 mm	l_2 mm	W_1 mm	W_2 mm
(1)	(2)	(3)	(4)	(5)
Small	100-110	80-90	45-55	50-55
Medium	120-130	90-100	60-70	55-60
Large	140-150	110-120	75-85	60-65

where

l_1 = The distance between the wrist joint and the tip of the thumb.

l_2 = The distance between the wrist joint and the second metacarpo-phalangeal joints.

W_1 = The distance between outer margins of second and fifth metacarpo-phalangeal joints.

W_2 = The distance between the outer margin of first and second metacarpo-phalangeal joints.

Note 1 — All dimensions are in opponence/pinch position.

Note 2 — Dimensions of all fingers shall be proportionate to the overall dimensions specified.

3. Materials

3.1 Light materials, such as aluminium alloys and plastics shall be used. The material shall conform to the relevant Indian Standards.

3.2 Material for the cable shall be monofilament nylon cord or a twisted cable made of stainless steel wire.

3.3 Inner gloves for functional hand type as per **1.1** shall be made from flexible PVC compound having a durometer hardness of Shore A 60-75, when tested as per Appendix F of IS : 9766-1981 'Specification for flexible PVC compound'.

3.4 For the functional hand as per **1.2** and **1.3** the covering shall be made of laminated plastic shell.

3.5 The fingers for type as per **1.2** may be made from cork wood or rubber or laminated plastics.

4. Functional Requirements

4.1 The unit shall have a provision of spring-loaded cable operated mechanism for the voluntary opening. The total displacement of the cable shall not exceed 60 mm to achieve maximum opening.

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4.2 When the unit is in the fully closed position, the design of the mechanism shall not permit passive opening without pull on the cable (applicable for design as per **1.1** and **1.2**).

4.3 In the maximum opened position the unit shall be able to grasp a cylinder of minimum diameter of 50 mm. The tension of the spring shall be sufficient enough to hold a cylindrical object of 500 g when grasped (applicable for design as per **1.1** and **1.2** only).

4.4 The force required for opening the hand shall be as follows (applicable for design as per **1.1**):

Size	*Opening Force*	
	Min N	*Max* N
Small	8·0	20·0
Medium	10·0	25·0
Large	13 0	30·0

5. Constructional Requirements

5.1 The unit shall have one of the following provisions of adaption with wrist unit:

a) M 12 thread system; and
b) 10 mm quick grip system.

5.2 The mechanism consisting of metallic links shall be supplied with a glove housing for the type specified at **1.1**.

5.3 The little and ring finger of the glove housing as per clause **1.1** shall have malleable wired rubber fillers to maintain passive position.

5.4 The aluminium fingers as per **1.1** shall have suitable PVC/rubber caps.

5.5 Total weight of the unit shall not exceed 400 g.

6. Workmanship and Finish

6.1 All components shall have good finish and shall be free from machining flaws and sharp edges so as not to damage the gloves. All moving surfaces shall be ground or reamed.

6.2 All aluminium parts shall be anodized before assembly to grade AC 10 of IS: 1868-1982 'Specification for anodic coatings on aluminium and its alloys (*second revision*)'.

6.3 Mild steel components shall either be electroplated in accordance with service grade 2 of IS: 1068-1968 'Specification for electroplated coatings of nickel and chromium on iron and steel (*first revision*)', or zinc plated as per IS : 1573-1970 'Specification for electroplated coatings of zinc on iron and steel (*first revision*)'.

7. Test

7.1 *Cyclic Test* — The complete assembled hand unit shall be tested for 15 000 cycles in a suitable testing equipment without any failure.

7.2 *Load Test* — The unit shall be capable of having a hook grasp of 10 kg weight in a closed position (applicable to types as per **1.1** and **1.2**).

8. Marking — The unit shall be marked with the manufacturer's name, initials or recognized trademark, side (right/left hand), and the size.

8.1 *ISI Certification Marking* — Details available with the Indian Standards Institution.

9. Packing — As agreed to between the purchaser and the manufacturer.

10. Sampling — A sampling scheme and criteria for acceptance shall be as agreed to between the purchaser and the manufacturer; however a recommended scheme is given below.

10.1 *Lot* — All the mechanical hands of the same type and size shall be grouped together to constitute a lot. Each lot shall be tested for the requirements of this specification.

10.2 Each mechanical hand in the lot shall be examined for dimensions (**2**), functional requirements (**4**), constructional requirements (**5**) and workmanship and finish (**6**). Those hands which fail in one or more of the requirements shall be rejected and only the satisfactory ones be accepted.

10.2.1 Suitable test certificates shall be issued by the manufacturer for the material used for the manufacture of mechanical hands.

10.3 Mechanical Tests

10.3.1 One completed assembly of hand unit shall be tested for cyclic test (**7.1**). For load test (**7.2**), 5 units for a lot size up to 100 and 10 units for lot size above 100 shall be randomly selected and subjected to test.

10.3.2 No failure shall occur in any of the mechanical tests if the lot is to be accepted under this clause.

EXPLANATORY NOTE

This Indian Standard covers all types of mechanical hands used as artificial limbs.

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TO
IS 11708 : 1986 SPECIFICATION FOR HAND, MECHANICAL

(*Page* 1, *clause* **2.1**, *second sentence*) — Insert the words 'and Fig. 1' at the end of the sentence.

(*Page* 1, *Table* 1) — Substitute the following for the existing Table:

TABLE 1 DIMENSIONS OF MECHANICAL HAND

SIZE (1)	LENGTH, *l* mm (2)	WIDTH, *W* mm (3)
Small	100-110	50-55
Medium	120-130	50-60
Large	140-150	60-65

where

l = distance between the wrist joint and the tip of the thumb, and

W = distance between the outer margin of first and second metacarpophalangeal joints.

NOTE 1 — All dimensions are in opponence/pinch position.

NOTE 2 — Dimensions of all fingers shall be proportionate to the overall dimensions specified.

(*Page* 1, *Table* 1) — Insert the following Fig. 1 after the table:

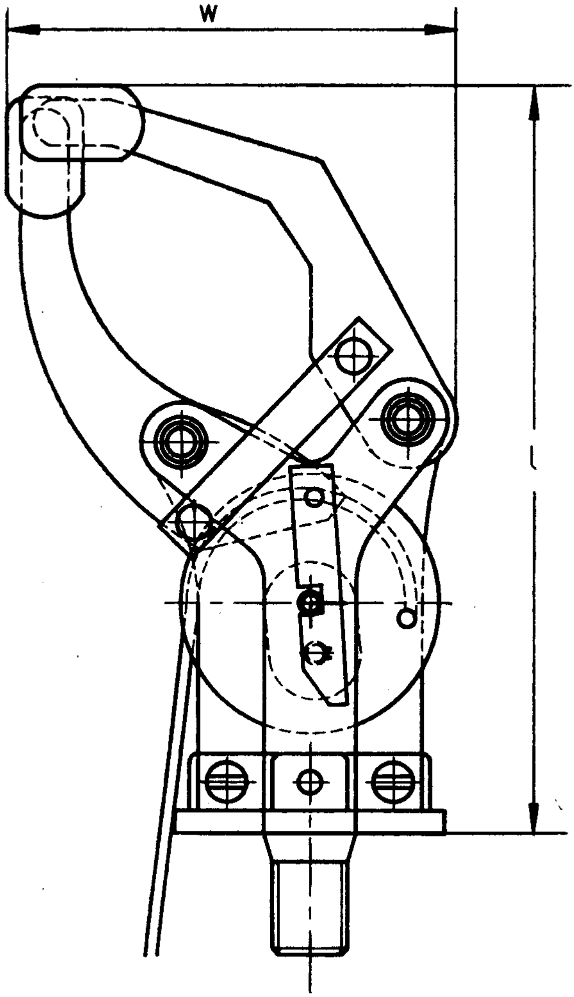

FIG. 1 HAND, MECHANICAL

(MHD 10)

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[*Page* 1, *clauses* **2** *and* **2.1** (*see also Amendment No.* 1)] — Substitute the following for the existing clauses:

'**2 Shape and Dimensions**

2.1 The general shape of the hand is shown in Fig. 1.'

(*Page* 1, *clause* **2.1**) — Insert a new clause **2.2** as follows:

'**2.2** The hand shall generally be made in two sizes, namely, small and large, or Size I and Size II. The dimensions of these sizes shall be as given in Table 1.'

[*Page* 1, *Table* 1 (*see also Amendment No.* 1)] — Substitute the following for the existing table:

TABLE 1 DIMENSIONS OF MECHANICAL HAND

(*Fig.* 1 and *Clause* 2.2)

Size	Length, *l* mm	Width, *W* mm
(1)	(2)	(3)
I (Small)	60 ± 3	70 ± 3
II (Large)	105 ± 5	135 ± 5

NOTE 1 — All dimensions are in opponence/pinch position.

NOTE 2 — Dimensions of all fingers shall be proportionate to the overall dimensions specified.

(*Page* 1, *clause* **3.1**, *second sentence*) — Delete.

(*Page* 1, *clause* **3.3**) — Delete.

(*Page* 2, *clause* **4.4**) — Substitute the following for the existing clause:

'**4.4** The force required for just opening the hand shall be 8 N, *Min* and that for full opening the hand shall be 30 N, *Max*.'

(*Page* 2, *clauses* **5.2** *and* **5.3**) — Delete.

(*Page* 2, *clause* **7.2**) — Substitute the following for the existing clause:

'**7.2 Load Test** — (Applicable to types covered under **1.1** and **1.2** only). The unit (in closed position) shall be capable of having a hook grasp of 50 N and 100 N for Size I and Size II hand respectively.'

(MHD 10)

Reprography Unit, BIS, New Delhi, India